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THE MARYLAND STATE HORTICULTURAL DEPARTMENT

Maryland Agricultural College, College Park, Md.

Circular No. 20.

June 16, 1900.

Second Emergency Circular on Pear Blight.

BY CHARLES O. TOWNSEND, STATE PATHOLOGIST.

Two circulars have already been issued this season on the subject of Pear Blight, and the prevalence and destructive nature of this disease, makes a third circular necessary at this time. Within the past two weeks a great deal of blight has been cut out and burned in accordance with directions given in circular number 9. We can now see the result of that treatment. If the cutting was severe enough to remove all the blight-producing organisms, the trees have a green healthy appearance and are doing well. If the cutting was not severe enough the disease was only slightly checked in its course down the limbs and branches, as evidenced by the appearance of more dead leaves and by a discoloration of the bark toward the ends of the cut branches. The failure to cut far enough below the point of attack to remove the disease entirely, was due in part to the fact that the growers were desirous of saving as much of the fruit as they could, and of mutilating the trees as little as possible. In all cases where the trees were not cut severely enough it will be necessary to go over them again and cut back until the bark, wood and pith have a perfectly healthy appearance, regardless of the loss of fruit or wood, since if the blight is left in the trees the blighted branches will die before the fruit has time to mature. In many instances no effort has been made to remove the blight from the deceased trees. This is due in a measure to the excess of work at this season and the inability to get the necessary amount of extra help, and also to a misunderstanding in regard to the nature of the disease.

It is still the belief of some growers that pear blight is due to the effects of hot or cold winds, of bright sun, of frosts or other weather conditions, or of soil conditions, or that it is due to the effects of an insects sting. A study of the disease however shows that it is produced by a minute organism (a bacterium) that usually, though not always, enters the tree through the blossoms and works its way downward in the sap between the bark and the wood. It is known that these organisms produce the disease, 1st because we can see them by the aid of a microscope in the sap of diseased branches. 2d because it is possible to take these organisms from diseased trees and to inoculate healthy trees with them. 3d because the disease when once introduced into a branch gradually spreads until the whole branch or even the whole tree may be destroyed. It is well known that the effects of winds, heat, cold, insect stings etc., are not contagious and do not spread in any way similar to the blight. The most important step in controlling the disease at the present time consists in cutting out and burning the diseased branches, as stated in a previous circular. The longer this step is delayed the more severe the cutting must be and the greater is the danger to the life of the tree. Some trees at this time are in their most critical stage. If taken in hand at once they may be saved; if left a few days longer the blight will be so far down in the branches that no treatment will be of any use, and no alternative will be left but to dig them up and burn them. Observation and experience also show that cultivation and fertilization have a tendency to increase the blight. As already stated the blight-producing organisms live in the sap, hence those conditions that tend to increase the sap, and produce a succulent growth favor the developement of the blight. For this reason it would be advisable to get orchards affected with blight down in sod as soon as possible, and to leave them in that condition for one or more years until the blight is eliminated or until it is reduced to a minimum. It need hardly be said that the blight is the most destructive enemy of the pear at present in this state, and that it seriously threatens the destruction of this important industry unless active measures are taken at once for its suppression.

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No.19.

THE MARYLAND STATE HORTICULTURAL DEPARTMENT

Maryland Agricultural College, College Park, Md.

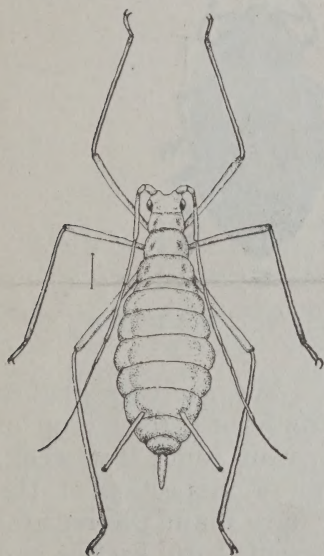
Circular No. 19.

June 3, 1900.

An Account of the Destructive Green Pea Louse, and Suggestions for Its Destruction.

BY WILLIS G. JOHNSON, STATE ENTOMOLOGIST.

This insect has been known to science about one year, in fact, received a scientific name in February 1900. It was described by the writer as the destructive green pea louse, *Nectarophora destructor*. It is one of the most important



Wingless Female

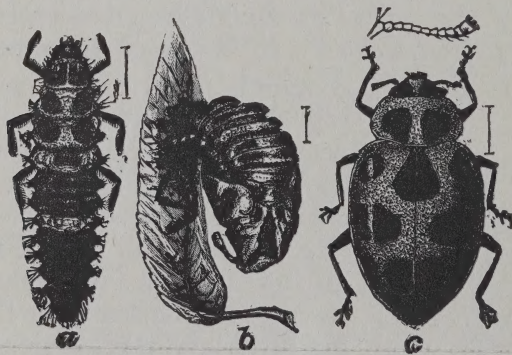
economic pests and is now commanding the close attention of growers of peas for commercial purposes all over the country. The writer has been in communication with the most extensive growers in the United States during the past few weeks. To meet the current demand for the latest information on this topic this revised circular is issued.

The pea louse has been present in the open fields in certain localities, and it is of the utmost importance that growers should be on their guard

There are two forms of the insect; the wingless female is shown in the figure while the winged form is represented on page 4. No male has as yet been found. The female produces living young which reach maturity in from ten to 15 days, possibly less time in hot weather. As an example a young one born March 4, reached maturity (winged form) March 16, or 12 days from time of birth and was producing living young

on the 19th. From March 19 to April 17 she become the mother of 111 young and died on the latter date. Her first young (wingless form) born March 19 was producing on March 31, or 11 days from time of birth. From March 31 to April 18, she gave birth to 120 young and died.

If permitted to breed unchecked, this pest sweeps over a large area in a very short time. The first louse upon peas in the open field was discovered April 28th in Caroline county May 1st it was difficult to detect them on the plants, but the pests multiplied so rapidly some pea fields were yellowish, dwarfed and shriveled, even dead by May 23. This condition existed where the peas were broadcast and in rows where nothing had been done to check and control the pest. Other rows where the brush, cultivator, pan, and roasting method had been used persistently, were in a green vigorous condition set full of peas. At that time, May 23, the outlook



Lady Beetle and Its Young. (After Chittenden).

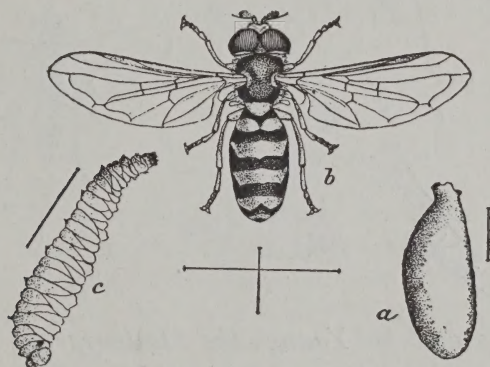
in the state, was very discouraging. We are very glad to report at the present time that the conditions for a crop of late peas have improved fully 25 per cent since last week.

We have just returned from a tour of inspection of the principal pea fields of the state. We have found the natural enemies of the lice, everywhere present, lady beetles and their larvæ, the lace winged fly and its larvæ, the Syrphus fly and its young, and soldier beetles are abundant in nearly all fields. The fungous disease we reported a few weeks ago, is present in both clover and pea fields. In clover, at some places, the lice are being destroyed by the thousands by this

disease. If the weather remains damp, warm and sultry, we fully expect to see a great many lice destroyed by this silent factor in the next few days.

It will not do however to place too much dependence in these natural destroyers. Every resource possible should be resorted to in order that the late crop of peas can be saved.

The brush and cultivator is still the most practical remedy where the peas are in rows. A long pan can be used in which the lice can be brushed when the peas are too large to admit of cultivation. This method has been used with success by A. G. Saulsbury and Bro., Ridgely, Md.

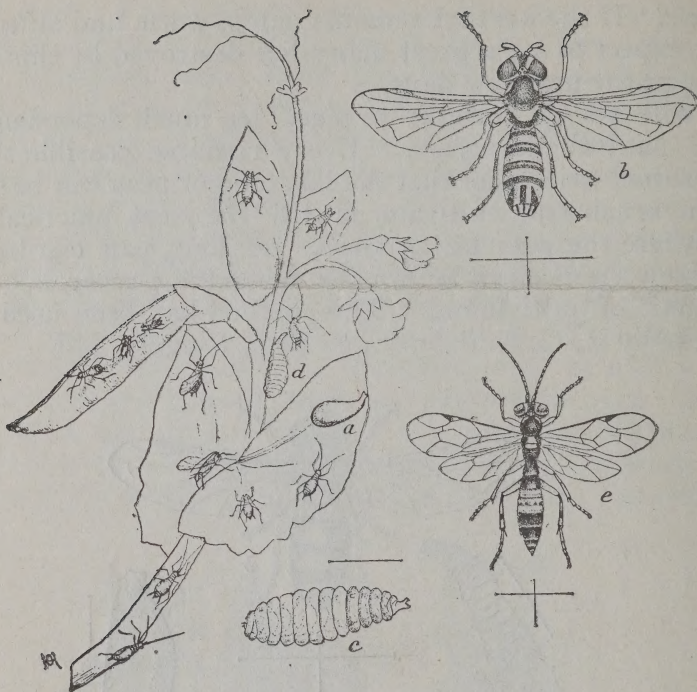


The American Syrphus Fly and Its Young.

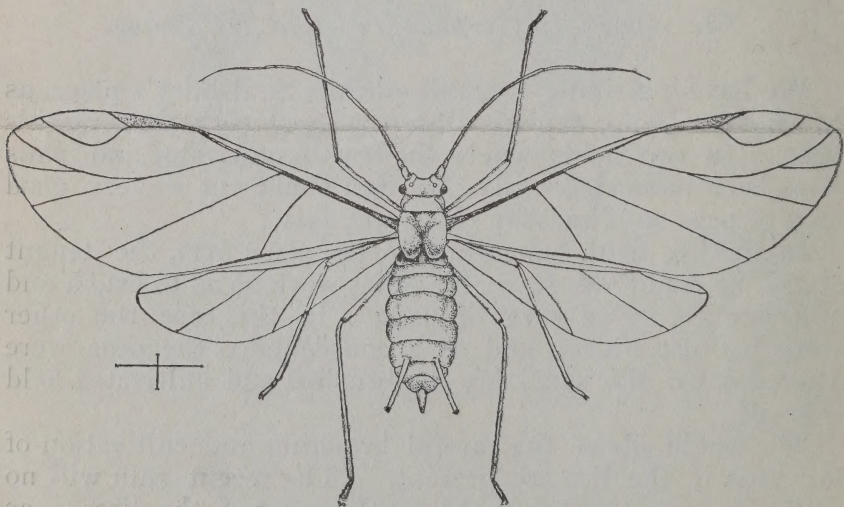
We have a striking example on Mr. Saulsbury's place, as to what can be accomplished by persistent work, fighting this pest. In two fields where the brush cultivator and pans have been used vigorously, Mr. Saulsbury cut a very good crop of peas on Thursday (May 31), last.

In another field belonging to the same firm, the tenant stated he could not leave his other work so as to brush and cultivate his seven acres of peas. In this case the other work had precedence, and as a consequence the peas were plowed down the same day the brushed and cultivated field was cut.

We would advise the careful brushing and cultivation of late peas if the lice are present. The recent rain will no doubt be a great factor in the development of the disease, as as well as stimulate the plant making it better able to resist the attack of the louse.



Syrphus Fly and Its Young, the Destroyer of the Pea Louse



The Winged Female Pea Louse.

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THE MARYLAND STATE HORTICULTURAL DEPARTMENT

Maryland Agricultural College, College Park, Md.

Circular No. 18.

June, 2, 1900.

Suggestions for the Treatment of Peach Leaf Curl.

BY CHARLES O. TOWNSEND, STATE PATHOLOGIST.

Owing to the prevalence of Peach Leaf Curl, and also to the numerous inquiries that have been received in regard to the cause and treatment of the disease, it has been considered advisable to issue a brief circular upon the subject at this time. Peach Leaf Curl is produced by a fungus (*Exoascus deformans*) that grows into the tissues of the leaves and causes them to thicken and become distorted. The affected leaves become paler and eventually turn brown and fall off. This loss of foliage is not only very injurious to the health of the trees, but it often causes the fruit to fall before it is ripe. If the diseased tree has sufficient vigor and a good supply of food material, it will soon put out a new set of leaves. These new leaves usually show no sign of the disease and remain until the normal shedding of the leaves takes place.

The best remedy for the disease consists in spraying the tree with Bordeaux mixture, it has been found by experience that little or no advantage is gained by spraying the trees after the blossoms fall or later; for this reason it would be practically useless to spray at the time of the "curl".

The first spraying should be done just before the buds open, and if the application at this time is thorough it will usually prevent the "curl", or at least greatly reduce its destructive work. In spraying before the buds open the ordinary Bordeaux mixture as described in Circular No. 2 may be used without injury to the trees, if however it is necessary to spray after the leaves appear it is advisable to use a weaker solution of the mixture as the leaves are very sensi-

tive and are in danger of being scorched by the bluestone. In this case it will be best to use the Bordeaux mixture one half strength, that is, only three pounds of bluestone and three pounds of lime per barrel of water. In other respects the directions for preparing the Bordeaux as given in Circular No. 2 may be followed. The application of Bordeaux mixture just before the buds open should be made each year since it is impossible to tell at that time whether the "curl" will appear or not, and furthermore the effects of the spray are cumulative. In addition to the spraying it is advisable that the affected trees be thoroughly cultivated and properly fertilized. As a food under the circumstances, probably Nitrate of Soda is best since it is easily taken up by the roots and readily aids in the formation of new leaves.

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No. 17.

THE MARYLAND STATE HORTICULTURAL DEPARTMENT

Maryland Agricultural College, College Park, Md.

Circular No. 17.

May 29, 1900.

Special Circular on the Destructive Green Pea Louse

BY WILLIS G. JOHNSON, STATE ENTOMOLOGIST.

During the past three weeks we have issued three circulars (No. 7; May 12; No. 11, May 15; and No. 13, May 21) on the destructive green pea louse. We have now completed another week's observations, and to meet the demand for the latest observations and developments we print the present circular.



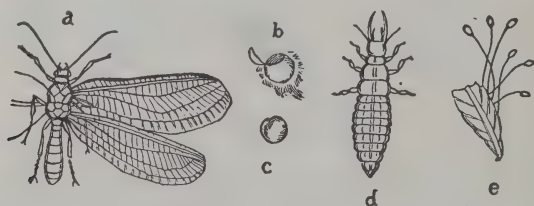
Lady Beetle and Its young.

So far as the plants were concerned, peas had very favorable weather conditions throughout the state the past ten days. Stimulated by the copious rains of the 18th and 19th and cool nights they developed very rapidly. On the other hand, however, the louse has kept pace with these conditions and has developed with equal rapidity and has perceptibly weakened the plants and cut short the prospect so promising the early part of the week.

Syrphus flies have been actively at work depositing eggs in the colonies of lice. Their young have devoured myriads of them; but the invasion of lice from clover has been far more numerous than those devoured. This accounts for the rapid increase of lice in peas, therefore during the past week.

In most parts of the State crimson clover has been cut or plowed down; but where it is standing it is full of lice. Red clover is green and vigorous in most fields and continues to be a veritable breeding bed for the lice.

Peas in all parts of the state have an increased number of lice upon them. Where the brush and cultivator and brush and tin pan methods are being used, the peas are holding their own and will make a fairly good crop. Some fields have already been abandoned, especially where nothing has been done to check and control this pest, and where the peas are in drills or broad cast. On Saturday last we continued our inspection in Frederick county, where we were accompanied by Messrs Goode Bros. of the Louis McMurray Packing Co. and Messrs Ross and Staley of the Monocacy Valley Canning Co. In this section practically all the peas are in drills, thus precluding any possible method of combating the pests. Most of the very early peas will be ready for the canner Saturday June 2nd; but the crop will be cut short fully one-third to one-half. The late peas have little or no chance of reaching maturity, and from present conditions in all parts of the State, late peas in drills will be almost a total failure. Late peas in rows can be mostly saved, if the brush, cultivator and pan are used persistently.

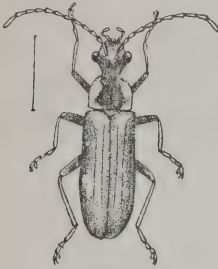


Lace-wing Fly and Its Young.

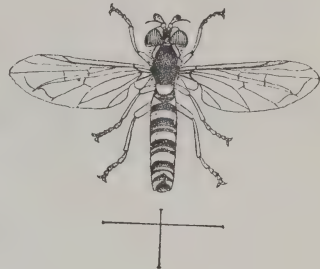
We have again found the louse disease, *Empusa Aphidis* in both clover and peas. Lady beetles and their young and the lace winged fly are actively at work devouring their quota of lice. The farmer must bestir himself to keep apace with the times and destroy his share of these life suckers.

We cannot expect any practical benefit from the air exhaust or sucker machine constructed by the Chisholm-Scott Co., of Baltimore mentioned last week. This machine has been given a practical test by the designers in the extensive fields of F. P. Roe and Brother at Greensboro, Md. While

correct in principal, it is of no practical use on a large scale in the field. It may be developed later. The same firm are now at work upon the mechanical side of a brushing machine which can be drawn by a horse; and we fully expect the perfection of some practical device along this line very soon by this enterprising firm,



The Soldier Beetle.



The Syrphus Fly.

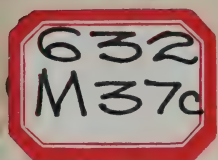
We have practically exhausted every resource in our efforts to find some vulnerable spot in the life history of this "iron-clad" pest; but we have not succeeded thus far. We have had the pest under daily observation one year last Thursday (May 24).

Our surest means of help is along the mechanical lines, and, possibly, the further study of crop rotation may give us a clue to the problem.

On the whole, the condition for a large crop of peas in this State is everything but encouraging. That the pea louse is not easily conquered is now admitted, even by Mr. R. P. Scott himself. In a recent circular he says:—"We regret to have to confess that we have been 'licked clean out of our boots' so far in our efforts to exterminate the pea louse".

We can not admit that we are defeated in this warfare; but one thing is sure, we must change our system of planting peas, and not plant in drills or broad cast, but in rows about thirty inches apart and very early; lessening our acreage of late peas as much as possible. Fully three-fifths of the crop in this state will come from the very early plantings

All the insects shown are destroyers of the Green Pea Louse.



No.16.

THE MARYLAND STATE HORTICULTURAL DEPARTMENT

Maryland Agricultural College, College Park, Md.

Circular No. 16.

May 28, 1900.

Special Instructions for Destroying Leaf-eating Insects with Paris Green.

BY WILLIS G. JOHNSON, STATE ENTOMOLOGIST.

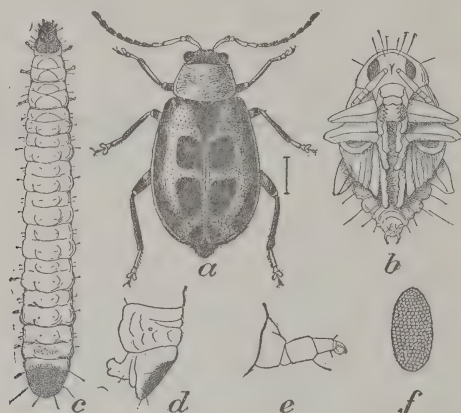
Owing to the fact that the Colorado potato beetle has appeared in unusual numbers over a large area of this state and is at the present time doing serious damage to potatoes, we have considered it advisable to issue this circular, giving



The Colorado Potato Beetle and Its Various Stages of Development. (After Riley).

special instructions for spraying potatoes and other plants of a similar nature, with Paris green. Tomato plants and beans are also being seriously injured over a large portion of the state by a small flea beetle and an insect known as the "bean leaf beetle". This latter creature eats holes in the

leaves of the bean and is very abundant at this time. The beetle responsible for this injury is a small one about one fourth of an inch in length, varying in color, and resembling a lady beetle in general form. It falls quickly to the ground when disturbed. It is shown in the illustration.



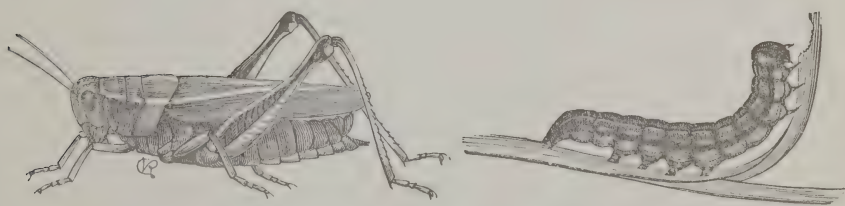
The Bean Leaf Beetle, from Egg to Adult. (After Chittenden).

In suggesting a remedy for these insects, it must be borne in mind that they are all leaf eating creatures and can therefore be destroyed by using Paris green, either in a dry form or in a solution. If the former, the Paris green should be mixed thoroughly with land plaster, air slaked lime or common wheat flour. For general purposes one pound of the poison to 100 pounds of the diluting material is used. If a small quantity is needed mix it at the rate of one ounce of Paris green to six pounds of the plaster, lime or flour. It should then be thoroughly stirred, and shaken over the plant early in the morning when the dew is on. This can be accomplished by placing the material in an old bag or an old vessel, which has previously been perforated, so as to shake the material over the plant. The dry method is usually more satisfactory than the wet method, especially where the plants are small but when the plants begin to form continu-

ous rows, the wet method is preferable, being less expensive and more easily applied.

In preparing the Paris green for use, it is desirable to use about one pound of the poison in about 140 to 160 gallons of water. It is desirable, in most instances, where the poison is mixed in water to add a small quantity of good stone lime, which has been previously slaked, usually an amount equal to the weight of the Paris green used. This will help to hold the Paris green in suspension. The solution should be thoroughly stirred while being sprayed. It is at times advisable to use the Paris green in Bordeaux mixture; in this instance, four ounces of the Paris green are used in each barrel containing 40 or 50 gallons of Bordeaux and is sprayed over the plants.

In handling this material any ordinary sprayer can be used but if a large acreage of potatoes or tomatoes is planted it would be advisable for the grower to secure a good barrel spray pump with a four-row attachment, so that four rows can be sprayed at one time. One man can handle the entire apparatus, and spray 12 to 15 acres or more a day. The barrel is placed in a wagon or cart drawn by one horse. We will be glad to give further instructions about apparatus or the preparation and application of this material, if desired.



*The Army Worm and Grasshoppers.
Other Leaf-eating Insects Destroyed by Paris green.*

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THE MARYLAND STATE HORTICULTURAL DEPARTMENT

Maryland Agricultural College, College Park, Md.

Circular No. 15.

May, 25, 1900.

Emergency Circular on the Treatment of Pear Blight

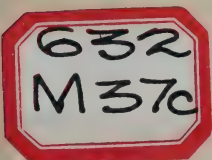
BY CHARLES O. TOWNSEND, STATE PATHOLOGIST.

The rapid development of Pear Blight, since the trees came into bloom necessitates the distribution of a special circular upon the subject. Pear orchards on the Eastern shore and in Western Maryland that have been examined within the past few days show that in certain varieties such as Bartletts and LeContes the blossoms and young fruit are practically all dead. Keifers have suffered much less than some others, but even these when growing near other varieties, that are more susceptible to blight are sometimes seriously affected. Since the blossoms that have been attacked by blight are past recovery, the important question is how can the trees themselves be saved? The organisms that have destroyed the blossoms, are still alive and are working their way downward between the bark and the wood, and unless something is done promptly the lives of thousands of pear trees will be destroyed. Fortunately in most of the trees examined to-day the blight has extended but a little distance below the point of attack. Hence by removing the fruit spurs a large majority of the organisms will be destroyed. In a short time the disease will extend downward through the spurs into the branches and finally into the trunks of the trees which will eventually become girdled. As stated in a previous circular (No. 3), the only known remedy for this disease consists in cutting out and burning the diseased twigs and branches. If this is done promptly thousands of trees that would otherwise be destroyed by the blight may be saved, but every day reduces the chances of

saving the trees. Care should be taken not to spread the disease by means of the knife, and each time after cutting a diseased branch, the instrument used should be dipped in a five per cent solution of carbolic acid or the blade should be wiped with a cloth moistened with the solution. The prevalence of the blight this year arises from the fact that a number of blighted trees were allowed to remain over winter, and to blossom this spring. It is important therefore that we take warning from this experience and see to it that all blighted trees are freed from the blight before the next blossoming season arrives. It is a safe rule to cut whenever and wherever the blight appears but it is especially important that no cases be allowed to winter over.

In numerous instances we have found that the cutting was not severe enough to remove all of the blight, and as a consequence the organisms have continued their work almost as rapidly as if no cutting had been done, until the whole tree top was lifeless. The cut surfaces should be examined and unless they show perfectly healthy wood and bark the saw or knife should be disinfected and the same branch cut again still lower. It is very important that a close watch be kept upon the trees even after they have been carefully gone over, and should more of the blight appear, it should be promptly removed. Considering the rapidity with which the blight has increased during the past two seasons it is evident that the most heroic efforts must be made to keep it in check or certain varieties of pears in this state will be doomed. If trees now standing are not worth the struggle they should be dug up and burned at once.

It must be remembered that the same blight readily attacks the apple and the quince and occasionally other kinds of fruit trees. While the blight was very destructive to apple blossoms last year, it is thus far much less serious this season. In whatever trees it occurs, however, it should be cut out, since it is possible for it to spread from the apple to the pear or from the pear to the quince etc.



No. 14.

THE MARYLAND STATE HORTICULTURAL DEPARTMENT

Maryland Agricultural College, College Park, Md.

Circular No. 14.

May 25, 1900.

Suggestions for the Destruction of the Melon Plant Louse.

BY WILLIS G. JOHNSON, STATE ENTOMOLOGIST.

Last year the melon plant louse, *Aphis gossypii* appeared in considerable numbers in the sections of this state where the cantaloupe is grown for commercial purposes. In Washington County where the growing of cantaloupes is a comparatively new industry, the insect was very conspicuous and almost totally ruined some fields.

This insect is therefore of great importance and some growers are already making inquiry about it. Mr. Caleb Long of Boonsboro, writes me as follows:—"Will spraying with kerosene (coal oil) emulsion be practical for combating the striped beetle which attacks cantaloupe; and if so will it also destroy the melon aphid or louse, thus serving a double purpose. This latter pest is one of great importance to us in this section and we desire information".

A few general remarks will be necessary about this pest before we can discuss the remedy for its suppression and control.

The melon plant louse is remarkable in its mode of development from the fact that the females produce living young. We also have exhibited here a striking case of parthenogenesis, that is, the production of young, generation after generation, without the intervention of the male. This is known as egamic reproduction or reproduction by budding. This

continues throughout the summer, when late in the fall the male is produced, fertilizes the female and eggs are laid which pass the winter. These eggs produce only females. They appear early in the spring, are winged, and are known as stem mothers, as shown in the illustration. She produces living young, all of which are females, no males appearing as indicated above until late fall. The young develop into either winged or wingless forms. It is not an uncommon thing to see the agamic mother walking around unconcernedly feeding, and at the same time giving birth to a young louse. The wingless forms are usually most numerous, and on account of their great fecundity provide for the increase of the progeny. This rapid multiplication would be disastrous to the species in consequence of the failure of the plant to supply the necessary food for so many individuals; thus it is, that the winged forms are produced in order to perpetuate the species as they migrate to other plants and start new colonies. It is also at the critical moment when a plant becomes overstocked with lice that ants are most active, carrying the delicate little wingless creatures, from place to place, establishing them where their favorite food supply is abundant.

The relationship existing between ants and plant lice would be an interesting topic for discussion, but we cannot consider it at this time. Suffice it to say, that ants do not eat the lice; but care for them tenderly, for the honey dew they receive; very much in the same manner we protect and feed cows for the milk they furnish us in return. An ant will carry a louse a long distance in its jaws and establish it on a plant more favorable for food.

Plant lice do not eat the leaf, but suck the juices from within and have for that purpose a long, lance-like beak which they insert in the tissues of the plant. They cannot therefore, be destroyed with Paris green or any arsenical or other poison that is eaten.

The cantaloupe is not the only plant this insect feeds upon, as has been suspected by many persons. It has been found feeding upon no less than thirty species of plants, not including the melons, squashes, etc.; which seem to be favorites.

The list is too long to give in this circular; but it includes many common weeds, field and garden crops, hot-house plants and even some orchard and forest trees. From this wide

range of food we are led to believe that the insect can live upon almost any plant. Eggs of the species have been found on purslane in October and upon strawberry plants in January. It seems possible that the viviparous forms, that is, those that produce living young, live over winter, as they have been found late in January, even after heavy frost and snow. They appear early in the spring, overstock the plants upon which they are feeding, and then migrate to the cantaloupe field.

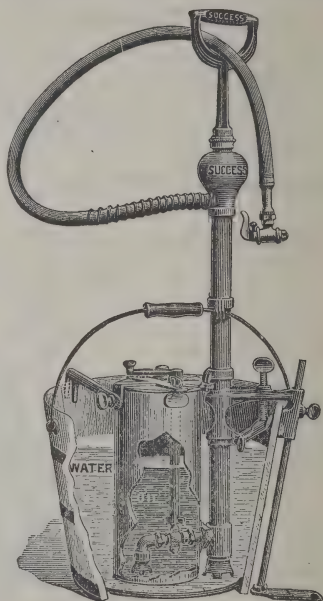


The Winged Form of the Melon Plant Louse.

(After Smith).

As soon as the first leaves of the melon are through the ground, a careful watch should be kept for the appearance of the lice. Do not wait until you see a dead or crumpled leaf before you are aware of their presence. Examine the under surface of the leaves at various places in the field at frequent intervals. Remember the louse is greenish and hard to see when only a few are clustered upon a leaf. The winged forms will be the first to be seen; while wingless females will appear later. Individual insects should be killed and if a leaf is found badly infested it should be plucked and destroyed. It can be buried 6 or 8 inches underground, crushed under foot, burned, or immersed in a pail containing water and a little kerosene.

If this pest gains a foothold in your fields, you should be prepared to combat it. This can best be done with a mixture of kerosene and water, or a solution of tobacco whale oil soap (Good's No. 6). It must be borne in mind that kerosene and water cannot be mixed with a spoon or paddle, or by stirring them together. An emulsion must be made as recommended in Bulletin 65, a copy of which will be sent upon application; or a mechanical mixture of the kerosene and water can be made with a small hand sprayer as shown in the illustration, made by the Deming Co., Salem, Ohio. I would advise some local dealer to handle these pumps and the soap. The kerosene is placed in the small tank and the water in the pail. By setting the gauge to 12 or 15, the proper percentage of oil and water is mechanically mixed through the nozzle.



The Success Kerosene Sprayer.

A 12 or 15 per cent mixture of kerosene and water is used for the destruction of this louse; but must be applied thoroughly. To reach the under surface of the leaves, use a brass elbow, costing about 25 cents, which can be attached to any nozzle connection. It can be bought with the pump. I would also use the vermorel nozzle.

The tobacco whale oil soap can also be used at the rate of one pound of soap dissolved in 8 to 10 gallons of warm water. It can be sprayed on the vines using the same little sprayer without the oil tank. The sprayer costs \$8.00 complete with the oil tank or \$5.50 without it. The whale oil soap is made by James Good, 939 North Front St., Philadelphia, Pa., and costs $3\frac{1}{2}$ to 5 cents per pound depending on amount. It can be purchased in 50, 100 or 170 pound kegs or in 425 pound barrels. It will keep indefinitely.

In the warfare against this pest I would advise growers to organize a systematic campaign against it and work together.

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ed they should by all means be kept free from cedar apples.

The second step and one that will control not only the rust but the scab, consists in the proper use of some fungicide.

For this purpose probably nothing is better than Bordeaux Mixture (For the preparation of Bordeaux mixture see circular No.2). It is important that apple trees be sprayed once before the buds open, but whether they have or have not already been sprayed the fungicide should be applied as soon as possible after the blossoms fall. Under no circumstances should trees be sprayed while in bloom as the fungicide is liable to interfere with pollination and fertilization, and if a poison is mixed with the spray it will be very destructive to bees. It is especially important that Paris green be mixed with the Bordeaux for this spraying in order to destroy the codling moth. For this purpose 4 ounces of good Paris green in each barrel of Bordeaux mixture is sufficient. The spraying should not be delayed any longer than possible after the blossoms have fallen, and this application should be followed by several sprayings at intervals of ten days or two weeks, the applications must be thorough and it should be remembered that the only use of Bordeaux mixture is to prevent the fungus from getting a foot-hold. It will not restore diseased fruit or diseased foliage.

THE MARYLAND STATE HORTICULTURAL DEPARTMENT

Maryland Agricultural College, College Park, Md.

Circular No. 10.

May, 12, 1900.

Suggestions for Treating Apple Rust and Scab.

By CHARLES O. TOWNSEND, STATE PATHOLOGIST.

These diseases, so familiar to apple growers are produced by fungi that attack either the foliage or fruit or both. They give the foliage a spotted sickly appearance and cause the fruit to become rough and knotted. The fruit is thereby rendered unsalable, and the vitality of the tree is greatly reduced. The same fungus that produces apple rust, grows upon cedar trees producing what is known as "cedar apples". Hence the first step towards controlling this pest should be the removal of all cedar trees from the vicinity of the apple

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THE MARYLAND STATE HORTICULTURAL DEPARTMENT

Maryland Agricultural College, College Park, Md.

Circular No. 9.

May 7, 1900.

Suggestions for the Treatment of Pear Blight

BY CHARLES O. TOWNSEND, STATE PATHOLOGIST.

This disease, variously known as Pear Blight, Fire Blight and Blossom Blight, is caused by an organism that finds its way into pear, apple and quince tree, lives in the growing part of the tree between the bark and the wood, where the sap is most abundant, and as rapidly as the ends of the infested twigs and branches die moves downward. It multiplies very rapidly and sometimes comes to the surface either in the blossoms or in exuding sap where the bark has been injured. It is usually taken up by bees as they go from flower to flower gathering their honey, and is thus spread from branch to branch, and from tree to tree. This accounts for the fact that we often see the effects of Pear Blight in the blossoms before it appears in the branches. We have found that spraying with Bordeaux mixture just after the blossoms fall has a tendency to prevent the spread of this disease, especially in the apple. If however the organisms have gained an entrance into the living parts of the twigs and branches, they are protected by the bark and no fungicide applied to the outside will destroy them. The only known remedy at this stage lies in cutting out and burning the affected parts. If the trees that are subject to this disease have not been examined during the past winter or spring they should be gone over at once, and all dead branches cut out. Remembering that the organisms are in the living and

not in the dead part of the affected trees, the diseased branches should be cut away if it is possible from twelve to twenty inches below the lowest dead point. The knife or saw used in cutting out these branches should be disinfected, by dipping the blade into carbolic acid and wiping with a clean cloth, each time a branch is removed. Otherwise there is danger of carrying the organisms from branch to branch and thus re-infecting the tree. If the deceased branches are not cut out the organisms will work downward until they reach the trunk of the tree which they will eventually girdle. Having removed and burned all the diseased branches the tree should be examined from time to time, and if the disease appears on other branches of the tree or if those that were cut, continue to die down, indicating that all of the disease-producing organisms were not removed cutting should be done again with out delay.

While it is not probable that any of the varieties of the pomaceous fruit are blight proof it is well-known that some varieties are attacked much more readily than others even under the same conditions. The more rapid the growth the more susceptible all varieties are to blight. Hence those conditions that tend to retard growth tend also to prevent blight. The only satisfactory remedy for blight however lies in cutting out and burning the diseased twigs and branches as stated above. It should be remembered that Pear Blight may attack wild trees related to the apple and pear, therefore such trees should not be allowed to grow in the vicinity of orchards of this kind.

Nursery stock or other trees that are not blossoming may also become infected with the blight producing organism. In this case it usually enters through the tops of the young growing shoots. Blighted nursery stock, may be saved by removing the deceased tips; providing it is taken in time and the cutting is severe enough to remove all the organisms.

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THE MARYLAND STATE HORTICULTURAL DEPARTMENT

Maryland Agricultural College, College Park, Md.

Circular No. 8.

May 7, 1900.

Suggestions for the Prevention of Plum Rot.

BY CHARLES O. TOWNSEND, STATE PATHOLOGIST.

In a previous circular (No. 2, March 22, 1900), it was suggested that plums should not be sprayed with the ordinary Bordeaux mixture, as both the fruit and foliage of certain varieties are very susceptible to injury from fungicides. It is well known however that the plum crop must be a failure unless something can be done to hold the rot in check. Since the full strength Bordeaux mixture is somewhat injurious to plums it is advisable to spray with a weaker solution. For this purpose it is better to use only four pounds of Bluestone and four pounds of Lime, and even then care should be taken in spraying the Japanese varieties which are especially sensitive. The same general directions may be followed in preparing the solution, as in the case of the ordinary Bordeaux mixture and if properly made, and thoroughly and persistently applied, it will prevent in a large measure, the attack of the rot-producing fungus. The number of sprayings must depend upon weather conditions. Damp hot weather is more favorable to the development of fungi, hence under these conditions spraying should be more frequent. It is important that all of the growing parts be kept covered with the fungicide. Fruit trees should be sprayed once before the buds open, but whether this has been done or not the plum trees should be sprayed again as soon as possible after the blossoms fall.

addition to spraying, the precaution should be taken to and burn all decayed fruit and in no case should the decayed fruit be allowed to remain on the tree from year to year. The reason for this will be clear when we remember that the spores of the fungus are formed on the surfaces of decayed fruits, and if allowed to remain on or under the leaves will enable the spores to be blown on to the healthy fruit and cause it to rot.

Another precaution in preventing plum rot lies in proper thinning of the fruit. It is well known that when two or more plums are in contact, these rot first, for the reason that the point of contact forms a favorable place for the fungus spores to lodge, and for moisture to collect. Hence in thinning the fruit care should be taken that the plums do not remain in contact with each other:

A Correction.

In circular No. 6, April 30, on Suggestions for Destroying the Asparagus Beetle, there is a typographical error in the second page, 10th line from bottom. It should read 4 ounces Paris green in 40 gallons of water. In the text the "o" in ounces was changed in spacing so as to read 40, it should be 4.